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ON THE CLASSIFICATION OF SAWFLIES (HYMENOPTERA SYMPHYTA)

By Robert B. Benson, M.A.
(*Department of Entomology, British Museum (Natural History)*)

With Forty-seven Text-figures.

[Read 1st June, 1938.]

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Introduction.

Ross, in a recent study of the nearctic genera of sawflies (1937), has collected together much morphological data and has made a notable contribution towards settling the major classification of the group. Primarily, however, he was considering the nearctic forms, and the groups unrepresented in this fauna are inadequately dealt with, mostly not even considered, in his attempt at reconstructing the phylogenies, as though the nearctic fauna had a special evolution independent of the rest of the world.

No one realises more than I how unlikely any system, put forward for these groups now, will be acceptable with the further increase of knowledge, but I have decided to publish this paper because I regard the major classification of insect groups as a very essential part of systematics. The mere describing of endless new genera and species, without any careful regard for their relationship to each other, is a common practice among systematists, and can only lead in the end to chaos.

I have three main reasons for considering the study of major classification as important:

(i) because without regard to some major scheme it is easy to overlook important correlations of characters and to describe new genera very inadequately, especially as present-day descriptions are of necessity mostly comparative;

(ii) because, although the older schemes have proved inadequate to bear the strain of many of the more recent discoveries, they have not been emended and kept up to date, and, if a natural classification or even a purely practical one is to be achieved, systems must be constantly built up and tested;

(iii) because, quite apart from the above reasons, some system, even if only an arbitrary one, is necessary in cataloguing genera or arranging a collection, or in supplying definite manageable units that can be monographed or revised, especially if different workers are to co-operate.

Thus it will be seen that two main objects are in view: to discover the truth of relationships and arrange a natural classification; and to arrive at some immediately practical scheme. The trouble is that these two elements are at

present confused and must be so, because of the different state of knowledge of different parts of the group. Generally speaking, knowledge of the groups in the holarctic fauna is far in advance of non-holarctic groups and of present-day forms is far in advance of fossil forms, knowledge of the adults, particularly their external features, is far in advance of their immature forms, their internal morphology and physiology.

I have not attempted, for the most part, to extend this major classification to grades lower than the subfamily, although tribes in some cases have been suggested. For, once provisional subfamily units have been reached, the work must begin again from the bottom with species, arranging these into genera and genera into tribes, until one is in a position to revise the subfamilies and families again.

At present much of the wing nomenclature based on the Comstock–Needham system and its many later alterations, besides being very complex, is entirely arbitrary in its interpretation and too unstable at present for application in systematic work on the Hymenoptera. I agree with Rohwer and Gahan (1916 : 21) when, in regard to this system, they say : " We believe that this system possesses no appreciable advantages to the systematist, while it does have certain disadvantages : first, that in the groups where the venation is much reduced the formula becomes long and cumbersome as well as meaningless (as in the Chalcids) ; second, the system is founded on insufficient investigation, and future studies will necessitate repeated changes to agree with the facts. We believe it is much better for taxonomic work to designate a given area by a given name and call it that regardless of its possible homologies and analogies. As a system of designating veins and cells for the morphologist the Comstock–Needham system possesses certain advantages, but as a terminology to be used in taxonomic work we do not believe it is desirable."

The numerous radical changes that have been suggested in the system of notation during the last few years have fully justified this statement, and for this reason I am reverting to the Jurinean system as used by Rohwer (1916) ; I am using this in preference to that suggested by Rohwer and Gahan (1916) because I cannot agree that some of the changes made in the latter were necessary.

No attempt has been made to give any historical account of the study of the classification of the sawflies, nor is any attempt here made to include references to all the works which have gone towards the present study. The most important contributions to the modern classification of sawflies are those of Konow (1905), MacGillivray (1906), Rohwer (1911) and Ross (1937) ; many other papers bearing on this problem are referred to in the course of this work and are listed at the end. Still others can be found at second hand by referring to the actual papers listed. A catalogue of the sawflies of the world is now appearing in Junk's *Hymenopterorum Catalogus* under the editorship of Dr. H. Hedicke, the parts dealing with the Cephidae, Syntexidae, Pamphiliidae (including Megalodontidae), Xyelidae, Siricidae and Xiphydriidae have already been published. Most of the central European species and genera can be named with the help of Enslin's monograph (1912–1918). Yuasa's study of the North American larvae (1922) is the only fairly comprehensive study of larvae available.

A distinction is made between those references with a general bearing on the classification of sawflies (these are collected in the list of references) and those references quoted to stress isolated facts such as the description of a larva or the separation of a genus (these are given in the text).

Discussion on the major classification of sawflies.

In the Orthandria there is little more to be added to Ross' summary of the present position in regard to the families. The Orthandria, with the male genitalia in the normal position, apparently show more generalised characters in these organs than do the Strophandria, in which the male genitalia are turned through 180° on the median axis prior to eclosion. Ross proposed three superfamilies for Orthandria :

Megalodontoidea for the Xyelidae, Pamphiliidae and Megalodontidae;
Siricoidea for the Orussidae, Siricidae, Syntexidae and Xiphydriidae;
Cephoidea for the Cephidae.

My concern now is with the Strophandria included by Ross in one superfamily, the Tenthredinoidea with eight or nine families : of these the Tenthredinidae, Cimbicidae, Blasticotomidae, Argidae and Diprionidae occur in the holarctic region and are fairly well differentiated, while the rest are mostly peculiar to Australia and South America and have been much less studied. This latter complex was considered by Rohwer (1911) to consist of four families : Perreyiidae, Pterygophoridae, Loboceridae and Pergidae. In 1934 I considered the Perreyiidae as one of the subfamilies of the Pterygophoridae which I separated from the Loboceridae and Pergidae by the absence of preapical spurs. I have also proposed four subfamilies for the Pterygophoridae (1934) and seven for the Pergidae (1935). Ross (1937 : 55–56) has added another family, the Acordulecerida.

Further study and the increase of available material have revealed still other groups, and it is proposed for the present to regard this complex as consisting of one family, the Pergidae, with 14 subfamilies. The only alternative to this seems to be to erect 9 new families to give family status to each of these subfamilies ; this would rather unbalance the classification of the other sawflies.

It should not be forgotten that though many of these groups appear to be isolated at present, links among living forms may yet be found and necessitate the fusion of one or more of the subfamilies, while, on the other hand, further groups of similar status are likely to be found. Detailed studies of larvae and biology, careful collecting and the study of much more adult material may enable one or more of these apparently divergent groups to be linked, but such studies are just as likely to reveal that still other groups, here considered to be closely related, are really only apparently so because of the present inadequate state of our knowledge.

It seems now to be regarded as essential, in any larger systematic revisionary work, to form definite conclusions on phylogeny. This is often done by selecting certain characters *a priori*, building up a scheme on this basis and discarding all facts that do not conform as not showing the "*true picture*," that is to say, the picture arbitrarily selected ! Such methods are unlikely to lead to satisfactory conclusions.

Parallelism is known to be rife. This can be seen by the comparative study in different groups of any one organ, such as the wings. Yet it is on the wings mostly that our only geological evidence is based, as generally wings alone are preserved in fossils in a sufficiently complete state for detailed study. I do not propose therefore to discuss further the phylogeny of the groups as a whole, or the interesting speculations that at once arise on their zoogeography, but certain generalisations will be made in the discussions of the various families, especially in the chapter on the Pergidae, as it was a study of this family that led me to write this paper.

No attempt has been made to quote every reference to every genus or larger group in Ross' work; at the same time a great many references to his work will be found, mostly for descriptions or figures. Wherever it has been thought possible to refer to one of Ross' figures instead of making a new one this has been done, and has enabled me to limit my figures to those groups or characters not dealt with by Ross. In several cases Ross' figures are used here to illustrate points different from those they were originally intended to explain.

It would be quite impossible to list the names of all those people who have helped me in this work: I should, however, like to mention specially: my colleagues Messrs. J. F. Perkins and W. H. T. Tams for long fruitful discussion on general questions of systematics and taxonomy (without necessarily making them responsible for holding any of the views expressed here); Dr. H. H. Ross (Illinois) for the friendly exchange of opinions and specimens over a number of years; Drs. Walther Horn and H. Sachtleben for their readiness in lending me many valuable specimens from Konow's collection in the Deutsches Entomologisches Institut; Dr. O. Conde (Latvia), Dr. V. V. Gussakovsky (Leningrad), and Dr. R. Malaise (Stockholm) for the exchange or loan of various specimens and Dr. W. Roepke (Holland) for lending me specimens of *Salatigia roepkei* Enslin; and lastly Miss B. Eborall for typing the manuscript.

Key to the families.

1. Antennae inserted well above the clypeus and on the anterior aspect of the head; hind-wings usually with at least one enclosed cubital or discoidal cell . . . . . 2.
–. Antennae inserted on the ventral side of the head below the lower margins of the eyes and below the apparent clypeus (Ross, figs. 23 and 24); hind-wings without any enclosed discoidal or cubital cell (Ross, fig. 177). (All regions.) . . . . . 7. Orussidae.
2. Third antennal segment very long (either forming the entire flagellum (Ross, fig. 97), which may be bifid (Ross, fig. 98), or bearing a single short apical segment (Ross, fig. 96), or surmounted by a slender terminal filament of 9–25 segments (Ross, figs. 86 and 87)) . . . . . 3.
–. Third antennal segment not abnormally long . . . . . 5.
3. Radial cell in fore-wing crossed by at least one vein; antenna usually of more than 3 segments . . . . . 4.
–. Radial cell not crossed by a vein; antenna of only 3 segments (the third of which may be bifid). (All regions except Madagascar and New Zealand.) . . . . . 13. Argidae.
4. Antenna only 3-segmented or with a small 4th apical segment; radial cell with one cross-vein; middle and hind tibiae without preapical spines; hind margin of pronotum strongly emarginate. (Palaearctic.) 11. Blasticotomidae.
–. Antennae with an apical filament of 9–25 segments; radial cell generally with 2 cross-veins (Ross, fig. 172); middle and hind tibiae with preapical spines; hind margin of pronotum almost straight. (Holarctic.) 1. Xyelidae.
5. Radial cell in fore-wing crossed by a vein . . . . . 6.
–. Radial cell in fore-wing not crossed by a vein . . . . . 13.
6. Pronotum with the hind margin almost straight, the emargination being at most as long as a tegula (Ross, figs. 121 and 122) . . . . . 7.
–. Pronotum strongly emarginate behind, the amount of emargination being much greater than the length of a tegula (Ross, figs. 123–127) . . . . 10.
7. Dorsiventrally flattened insects with ♀ ovipositor very short and not projecting beyond apex of abdomen; front tibia with two apical spurs . . 8.

–. Cylindrical or laterally compressed insects; ♀ ovipositor projecting beyond apex of abdomen; front tibia with only one apical spur . . 9.

8. Antennae flabellate, with apical projections to the flagellar segments (Ross, fig. 94); intercostal area of fore-wing open, without any longitudinal or cross-vein; anal cell of fore-wing not contracted basally and containing a scaly patch within the cell; mesosternum trapezoidal in shape (cf. Ross, fig. 134); tongue, when extended, usually as long as head capsule. (Palaearctic.) . . . . . 3. MEGALODONTIDAE.

	Head closed and body flattened.	Head with maxillaris or postgenal bridge.	Antenna with long 3rd segment.	Pronotum with straight hind margin.	Mesosternum triangular.	Outer apical spur on front tibia modified.	Preapical tibial spines present.	Basal or (and) intercalate hamuli present.	Radial cross vein present in forewing.	Anal cell of forewing reduced.	Male genitalia twisted 180	Larvae with abdominal pseudopods.	Confined to Holarctic region.	Occurring in Australia.	Other special features.
Cyrtandria															
Xyelidae.			+	+	+	+	+	+	[Two present]			+	+		Apical segmented thread to antenna.
Pamphiliidae.	+			+	+	+	+	+	+				+		Antenna long multisegmented and threadlike.
Megalodontidae.	+			+		+	+	+	+				+		Antenna flabellate.
Syntexidae.		+		+	+	+		+	+				+		Labium and incisions in front of mesepisternum.
Xiphydriidae.		+				+		+	[+]					+	Mesonotum with transverse suture, neck long.
Siricidae.		+				+		+	+					Absent	Mesoscutum with side lobes.
Orussidae.		+				+		+		+				+	Antenna on ventral aspect of head.
Cephidae.		+		+	+	+	[+]	+	+						No cenchri and constriction at apex of propodeum.
Stephanidria															
Tenthredinidae.						[+]			[+]	[+]	+	+		+	Antenna normally 9-segmented.
Diprionidae.										[+]	+	+	+		Antenna branched or serrate.
Blasticotomidae.			+			+			+		+				Antenna 4-segmented.
Cimbicidae.		[+]							+	[+]	+	+			Abdomen carinate at side.
Argidae.			+				[+]			[+]	+	+		+	Antenna 3-segmented.
Pergidae.		[+]				[+]	[+]			+	+	[+]		+	Antenna variable.

TABLE 1.

MAIN CHARACTERISTICS OF THE SAWFLY FAMILIES COMPARED

. Antennal segments simple (Ross, fig. 88); longitudinal intercostal vein present; anal cell of fore-wing is contracted basally thereby excluding the scaly patch from the cell; mesosternum is triangular in shape with a praesternal bridge (cf. Ross, fig. 129); tongue shorter than head capsule. (Holarctic.) . . . . . 2. PAMPHILIIDAE.

9. Abdomen constricted at apex of 1st abdominal segment (Ross, fig. 143); cenchri absent; apical spur on front tibia with inner margin simple (Ross, fig. 119). (Holarctic and Madagascar.) . . . . 8. CEPHIDAE.

–. Abdomen not so constricted (Ross, fig. 140); cenchri present; apical spur on front tibia with inner margin pectinate (Ross, fig. 118). (Nearctic.) 4. SYNTEXIDAE.

10. Antenna filiform or at most subclavate (Ross, figs. 90, 91, 101, 102, etc.) and abdomen not carinate at the side margins . . . . . 11.

–. Antenna capitate (Ross, figs. 99 and 100); side margin of abdomen carinate so that each tergum is divided into a dorsal and ventral portion (fig. 15). (Holarctic, Oriental and S. American.) . . 12. CIMBICIDAE.

11. Scutellum not divided behind into a separate sclerite (Ross, figs. 123 and 127); front tibia with one large apical spur and the second one absent or at most vestigial (Ross, figs. 116 and 117); head with the postgenae meeting behind in the middle line (Ross, fig. 19). . . . . 12.

–. Scutellum behind divided off into a separate narrow transverse sclerite, the post-scutellum (Ross, figs. 124 and 125); front tibia always with two well-developed apical spurs (Ross, fig. 114); head open (Ross, fig. 2). (All regions except New Zealand.) . . . . . 9. TENTHREDINIDAE.

12. Neck long (cervical sclerites viewed from the side appear longer than broad); last abdominal segment without a horn-like projection; maxillary palp 4- and labial palp 3-segmented, the last segment without a sensory cup, the first elongate (Ross, figs. 69 and 82); mesonotum usually with a transverse furrow (Ross, fig. 123). (Holarctic, S. American, Oriental, Australian and New Zealand.) . . . 5. XIPHYDRIIDAE.

–. Neck short (cervical sclerites viewed from the side appear broader than long); last abdominal segment with a hornlike projection; maxillary palp 1-segmented; labial palp 2–3 segmented, the last segment enlarged and bearing a large sensory cup, the first segment not elongate (Ross, fig. 84); mesonotum not divided transversely but with a lateral lobe divided off each side of the scutum (Ross, fig. 127). (Holarctic, Congo, Oriental, S. American, and introduced elsewhere.) . 6. SIRICIDAE.

13. Hind-wing with an enclosed cubital but no discoidal cell and with no anal cell (figs. 39–41) (in *Cladomacra* Kirby the anal cell is indicated but not closed apically); anal cell of fore-wing petiolate or absent (figs. 34–38); antennae approximately, but rarely actually 9-segmented, and often serrate, branched, plumose, clavate or capitate; apical spur or spurs on front tibia simple (cf. Ross, fig. 113). (Australian, S. American with one sub-family spreading into the Nearctic region, and one species in Celebes.) . . . . . 14. PERGIDAE.

–. Hind-wing with an enclosed discoidal cell as well as a cubital and also a closed anal cell; anal cell of fore-wing in the primitive form with an oblique cross-vein, contracted in the middle or petiolate; if petiolate (Ross, fig. 193) then the antenna is 9-segmented and setiform without prolongations to the segments (cf. Ross, fig. 93); inner spur on front tibia may be bifid apically (cf. Ross, fig. 114). (Holarctic, S. American and Oriental.) . . . . . 14.

14. Antenna without apical prolongations to segments or with only 9 antennal segments (cf. Ross, figs. 88, 93 or 104). (TENTHREDINIDAE part or XIPHYDRIIDAE part.) . . . . . 11.

–. Antenna with more than 9 segments and serrate or plumose by some of the flagellar segments being apically produced or at least swollen (Ross, figs. 106 and 107). . . . . 10. DIPRIONIDAE.

THE FAMILIES OF SAWFLIES CONSIDERED.

(1) Orthandria.

Superfamily Megalodontoidea.

Of the three families included here by Ross (p. 35), the PAMPHILIIDAE and MEGALODONTIDAE differ from all other sawflies in the peculiar form of closed head in which the post-genae are produced ventrally to fuse with the sides of the clypeus separating the foramina for the mandibles from that for the mouth opening; the mouth opening is further separated from the occipital foramen

by the development of a plate, the maxillaria, between the anterior arms of the tentorium (Ross, figs. 4 and 5). Their peculiar dorsi-ventrally flattened form is also characteristic.

The family XYELIDAE (Ross : 106) was also placed by Ross in the superfamily Megalodontoidea. It lacks the very peculiar "closed" head of the two latter families and the strong dorsi-ventral flattening of the whole body; its antenna, with the long third segment surmounted by a thread of 9–25 segments (Ross, figs. 86 and 87) and the usual presence of two cross-veins to the radial cell in the fore-wing (Ross, fig. 172) are quite peculiar characters.

1. XYELIDAE (cf. Ross : 106–108) : confined to the holarctic region; the four palaearctic genera (except *Xyelatana* Benson) occur also in the nearctic region and are dealt with by Ross. The family has not been satisfactorily divided into subfamilies. The palaearctic species are dealt with by Gussakovsky (1935) and Benson (1938), *Proc. R. ent. Soc. Lond.* (B) **7** : 32–36.

The larvae are free living and have a pair of pseudopods to each abdominal segment.

2. PAMPHILIIDAE (cf. Ross : 108–110). The six palaearctic genera except *Celidoptera* Konow and *Caenolyda* Konow occur also in the nearctic region and are dealt with by Ross (1937). Keys to the palaearctic forms are given by Gussakovsky (1935). The larvae live in webs or leaf-rolls and have no abdominal pseudopods; the thoracic legs are seta-like and the antennae are 7-segmented.

3. MEGALODONTIDAE : are confined to the palaearctic region; the three genera are dealt with by Konow (1905) and Gussakovsky (1935). The larvae are very similar to those of the PAMPHILIIDAE.

Superfamily Siricoidea.

4. SYNTEXIDAE (cf. Ross : 110–111), contains one species, *Syntexis libocedrii* Rohwer from California. This species was placed by Rohwer (1915) as an abnormal Cephid. In 1935 (1) I erected a new family for it and this family is further discussed by Ross. The larvae are similar to those of XIPHYDRIIDAE.

5. XIPHYDRIIDAE (cf. Ross : 111) : the genus *Xiphydria* Latr. (*sens. lat.*) occurs in all the zoogeographical regions except possibly the Ethiopian and Mascarene. The South American genus *Derecyrta* Smith has no cross-vein to the radial cell of the fore-wing. No recent attempt has been made to revise the genera since Konow (1905). Gussakovsky (1935) has dealt with the palaearctic species. The larvae bore in wood and are without abdominal pseudopods and with 3-segmented antennae.

6. SIRICIDAE (cf. Ross : 111–113) : holarctic Congo, oriental and S. American. The genera are dealt with by Bradley (1913), who recognised two subfamilies SIRICINAE and TREMECINAE. *Siricosoma* Forsius was said by Forsius (1933) to break down the proposed subfamilies, although he did not mention the nature of its mouth-parts or whether it had cerci; an examination of the type shows quite clearly that it belongs to the SIRICINAE as it has, among other characters, well-developed cerci and 3-segmented palps to the mouth-parts. *Xoanon* Semenov and *Xanthosirex* Semenov also belong to the SIRICINAE.

The larvae are very similar to those of the XIPHYDRIIDAE, but have 1-segmented antennae.

7. Orussidae : Ross (pp. 33, 35 and 113) regards the Orussidae as belonging to the Siricoidea; Rohwer (1918) proposed a separate suborder, Idiogastra, for them, and Bischoff (1926) makes the Orussoidea a separate superfamily with one family. The larvae, so far as is known, are highly specialised parasites of wood-boring beetles (Buprestidae and Cerambycidae).

I have recently published a revision of the genera of this family with a synopsis of the Australian species (1938, *Ann. Mag. nat. Hist.* (11) **2 :** 1–15).

Superfamily Cephoidea.

8. Cephidae : Ross (pp. 33, 114–116) erected a new superfamily for the single family Cephidae. This family was regarded by Konow as consisting of two tribes : Macrocephides and Cephides. In my revision of the genera (1935 (1)) I regarded the genera of these two tribes as belonging to one subfamily, the Cephinae and added to these a new subfamily Athetocephinae for the peculiar Mascarene genus *Athetocephus* Benson. It appears now that the number of pre-apical spines on the hind tibiae varies in certain species of *Cephus* etc., and is not therefore as reliable a character for separating groups of genera as I then thought.

Ries (1937, *Trans. Amer. ent. Soc. Philad.* **63 :** 259–324) in his revision of the nearctic species argued that *Janus* Stephens is the most primitive Cephid. He said : " The phylogeny of the Cephidae is based chiefly upon the development of the antennae and tarsal claws. The grouping is also upheld to a certain extent by the male genitalia. While other external characters present some criteria for grouping, they do not show as clearly as the antennae and tarsal claws the true picture of the phylogenetic development."

The larvae are stem borers—without abdominal legs, with antennae of 4 or 5 segments and with ocellarae.

Families only known as fossils.

Mention should be made here of the following families known only as fossils; these may (or may not) be closely related to modern sawflies. Paroryssidae Martynov and Anaxyelidae Martynov from the Jurassic of Turkestan and the Pseudosiricidae Handlirsch from the Jurassic and later rocks in Europe.

Superfamily Tenthredinoidea.

9. Tenthredinidae (cf. Ross : 60–105). This family is easily the largest group in the suborder, being the dominant sawfly family in almost all parts of the world except Australia. In Australia it is represented only by one known native species, *Cheilophleps xantha* Benson, and is replaced largely by the Pergidae.

The range of form and structure is very wide but the abundance of closely related species and genera makes it difficult to subdivide satisfactorily; on the other hand, it has been more studied than many other families because of its dominance in the holarctic region.

The latest contribution to the study of its further division is that of Ross (pp. 60–64) in his study of the nearctic genera; the genera of the rest of the world are badly in need of revision and until this is done any suggested subfamily arrangement can only be preliminary. I have no doubt that it will be found more convenient later to erect new subfamilies for some of the peculiar groups of exotic genera when more is known about them, but with the scantiness of available material and in the absence of biological data, it is not clear whether

some of these forms really represent isolated groups or simply the ends of diverging lines not yet separated. Such groups as those I am calling the new tribes Distegini and Xenapatini of the EMPHYTINAE, Senocliini and Atelozini of the BLENNOCAMPINAE, etc. may really be distinct subfamilies, but since they contain comparatively few species, there is no immediate advantage in separating them.

MacGillivray (1906) erected a subfamily LYCAOTINAE; Ross (p. 101) accepted this and added another subfamily ADELESTINAE (pp. 67–68). Neither of these do I consider as valid.

(*a*) LYCAOTINAE: *Lycaota* was originally placed by Konow (1905) in his Selandriades; MacGillivray (1906) erected a new subfamily for it; Rohwer (1911) placed it in a separate tribe within his subfamily EMPRIINAE (= BLENNOCAMPINAE); Ross recognised MacGillivray's subfamily and said (p. 101) this group " is undoubtedly the present-day representative of the ancestor of the TENTHREDININAE." He placed them close to the TENTHREDININAE on account of the form of the anal cell in their fore-wings; this is more or less contracted in the middle in the neighbourhood of the cross-vein. He kept them distinct from the TENTHREDININAE because the basal vein reaches the subcosta close to the origin of the cubitus and because the cervical sclerites are pointed in front and do not meet. He knew only of three nearctic species belonging to two genera, *Lycaota* Konow and what he called *Lycaotella* Ross; *Lycaotella* Ross is antedated by *Blennogeneris* MacGillivray **syn. n.***

Actually the group is not limited to the Nearctic region. Other closely related genera are *Synaptoneura* Konow and ? *Trichotaxonus* Rohwer (S. America), *Hoplocampoides* Enslin (Europe), *Salatigia* Enslin and *Malaisea* Forsius (Malay and Java) and *Cheilophleps* Benson (Australia).

Ross' pronouncement on the relationship between this group and the TENTHREDININAE was largely based on the similarity of the contraction of the anal cell in the former and in the higher TENTHREDININAE.

This form of contraction is not, however, peculiar in the TENTHREDINIDAE to these two groups as maintained by MacGillivray and Ross: it seems in fact to be one of the normal ways for the simple anal cell to become divided into two before becoming petiolate, and it has probably happened in this way in the NEMATINAE, in the Fenusini but apparently not in the Phyllotomini, where as an exception the division seems to begin at the basal shoulder. In the BLENNOCAMPINAE the anal cell has reached the petiolate state either by contraction in the middle and then fading out of the basal loop (cf. *Tomostethus* Konow, etc. for intermediate stages) or else by the simple breaking down of the basal portion without contraction (cf. *Antholcus* Konow and *Ateloza* Enderlein for intermediate stages). In *Tomostethus* Konow and related genera the cell has started to contract in the middle and then the basal loop has tended to fade out; in some specimens it is difficult to distinguish the form of this cell in *Tomostethus* and *Lycaota* (cf. Ross' figs. 188 and 192).

In the two other characteristics of the TENTHREDININAE, the form of the cervical sclerites and the relationship between the basal and cubital veins in the fore-wing, the LYCAOTINAE disagree with the TENTHREDININAE, but agree also closely with the BLENNOCAMPINAE. In fact it is so difficult to find any

* MacGillivray, 1923, *Univ. Illinois Bull.* **20** : 8, after describing *Blennocampa typicella* MacGill. said : " This species is referred tentatively to this genus. If a new generic name is found necessary, *Blennogeneris* can be used." Ross, 1932, *Canad. Ent.* **63** : 44, regarded *B. typicella* MacGill. as a variety of *Selandria spissipes* Cresson, which he made the type of his new genus *Lycaotella*. Therefore *Blennogeneris* MacGillivray (= *Lycaotella* Ross), syn. nov.

valid reason for keeping the Lycaotinae apart from the Blennocampinae (as defined at present by Ross) that I have decided to regard the former simply as a tribe of the latter.

(*b*) Adelestinae: This subfamily was erected by Ross on the basis of a single specimen of one species differing from the Selandriinae, according to Ross, (1) in lacking a prepectus, (2) in having a cross-vein to the anal cell near the basal shoulder, and (3) in lacking a post-tergite to the scutellum. To deal with his points: (1) the prepectus though normal in the Selandriinae is not present in all genera (cf. *Pseudotaxonus* A. Costa) and in other species it is obsolescent (cf. *Aneugmenus morio* Klug); (2) a very similar anal cell occurs in the two type specimens of *Selandria andeana* Cameron from Ecuador, but the species has a prepectus and post-tergite to the scutellum. Ross elsewhere did not attach much significance in the Selandriinae to the position or even existence of a cross-vein to the anal cell, so that, for example, he placed in one genus (*Strongylogaster* Dahlbom, p. 67) forms with and forms without cross-veins; (3) the obsolescence of the suture separating the post-tergite is also characteristic of *Selandria* Leach and *Coryna* Lepeletier.

I regard *Adelesta* Ross as belonging to the Selandriinae on the evidence submitted. If some good reason for its isolation comes to light later, as, for instance, from the study of its biology, that would be a different matter, but, by themselves, such fluctuating morphological characters do not in my opinion justify the erection of a new subfamily on a single specimen of a single species in a group where abnormalities are not infrequent.

Two groups, the Phyllotominae and Emphytinae, which I have retained as subfamilies are rather more arbitrary than the others and will perhaps require to be split up later.

The Phyllotominae appear to include four distinct groups, each of which is possibly of subfamily rank. The Fenusini have larval pseudopods only on abdominal segments 2–7 and 10 as in the Nematinae, while the superficially similar Phyllotomini have pseudopods on segments 2–8 and 10 as in all other Tenthredinidae whose larvae are yet known.

The Emphytinae contain all the remaining Tenthredinidae with a generalised anal cell after the members of the other subfamilies have been removed. Not unnaturally, then, it contains several small groups that could justifiably be separated off if such a course were thought desirable.

Key to subfamilies.

1. Basal vein joins subcosta of fore-wing at a point much closer to the origin of the cubitus than the length of the 1st transverse cubital vein, *or* the basal and 1st recurrent veins converge towards the stigma (Ross, figs. 181–193) . . . . . 2.
–. Basal vein joins subcosta at a distance from the cubitus equal to or greater than the length of the 1st transverse cubital vein; basal and 1st recurrent veins parallel or diverge towards stigma (Ross, figs. 194 and 196) Tenthredininae.
2. Extreme base of cubitus in fore-wing is recurved towards stigma and reaches subcosta at some distance from the basal vein (Ross, figs. 182–184); basal and 1st recurrent veins converge towards stigma; hind-wing with 2 enclosed cells . . . . . 3.
–. Extreme base of cubitus not recurved towards stigma *or* the origins of the basal vein and cubitus coincide . . . . . 4.
3. Second transverse cubital vein in fore-wing absent so that the combined 2nd and 3rd cubital cell receives both recurrent veins; prepectus to

mesepisternum absent; cervical sclerites meet broadly in front; anal cell in fore-wing always with oblique cross-nerve behind the middle . DOLERINAE.

–. Second transverse cubital vein present in fore-wing so that the 2 recurrent veins are received in separate cubital cells; prepectus generally present; cervical sclerites generally not meeting in front; anal cell of fore-wing generally without any cross-vein . . . . . SELANDRIINAE.

4. Radial cell of fore-wing crossed by a vein; recurrent veins received in different cells, *or* hind-wing without 2 enclosed cells . . . . . 5.

–. Radial cell not crossed by a vein and/or 2nd cubital cell receives both recurrent veins (Ross, figs. 193 and 195); hind-wing with 2 enclosed cells part of NEMATINAE.

5. Basal vein in fore-wing joins subcosta at a distance from the cubitus as great or greater than $\frac{3}{4}$ the length of the 1st transverse cubital vein and converges so strongly towards the 1st recurrent that if produced they would meet at a point nearer the base than the apex of the stigma (Ross, figs. 185, 187–189 and 191) . . . . . 6.

–. Basal vein joins subcosta at a distance from the cubitus less than $\frac{3}{4}$ the length of the 1st transverse cubital vein and/or is subparallel with or only slightly converging towards the 1st recurrent, so that if produced they would *not* meet at a point nearer the base than the apex of the stigma (Ross, figs. 186, 190 and 192) . . . . . 9.

6. Anal cell of fore-wing divided into two by a medial contraction, but through the partial or complete breaking down of the basal loop it may become petiolate (Ross, figs. 188, 189 and 191) . . . . . 7.

–. Anal cell with a cross-nerve; the basal loop may be faint and at the basal contraction may even form a tangent with the submedian (Ross, figs. 185 and 187) . . . . Phyllotomini and Caliroini of PHYLLOTOMINAE.

7. Hind-wing with 2 enclosed cells and prepectus to mesepisternum generally present; anal cell of fore-wing with basal loop clearly defined (Ross, fig. 191) . . . . . part of NEMATINAE.

–. Hind-wing without 2 enclosed cells; anal cell of fore-wing with basal loop faint or absent (Ross, figs. 188 and 189) . . . . . 8.

8. Larger species (over 6 mm. long); cenchri large so that the distance between them is much less than the breadth of one (Ross, fig. 188) *Tomostethus* of BLENNOCAMPINAE.

–. Smaller species (under 5 mm. long); cenchri smaller so that the distance between them is greater than the breadth of one (Ross, fig. 189) Fenusini of PHYLLOTOMINAE.

9. Antenna generally 9-segmented (may be 10–13 at most) . . . . . 10.

–. Antenna approximately 23-segmented with apical projections from the apices of the middle segments below; cervical sclerites meeting broadly in front; anal cell of fore-wing with oblique cross-nerve but the loop is very faint just in front of the cross-nerve . . *Cladiucha* of EMPHYTINAE.

10. Anal cell of fore-wing with a cross-vein and with the basal loop unbroken . 11.

–. Anal cell divided into two by a medial contraction *or* petiolate through the fading out or incompleteness of the basal loop (fig. 4 and Ross, fig. 190) part of BLENNOCAMPINAE.

11. Anal cell of fore-wing narrower at its basal contraction that in the neighbourhood of the cross-vein or there is no basal contraction (fig. 3 and Ross, fig. 186) . . . . . part of EMPHYTINAE.

–. Anal cell narrower in the neighbourhood of the cross-vein than at the basal contraction (Ross, fig. 192) . . . . . Lycaotini of BLENNOCAMPINAE.

SELANDRIINAE (cf. Ross, pp. 64–68).

The main characters of this subfamily are the curving back of the base of the cubitus of the fore-wing towards the stigma (Ross, figs. 181, 183, and 184),

the convergence of the basal and 1st recurrent veins towards the stigma, the frequent disappearance of the anal cross-vein (Ross, fig. 153), the presence of two enclosed cells in the hind-wing (Ross, fig. 149), the presence of a prepectus (Ross, fig. 135) and the cervical sclerites not meeting in front (Ross, figs. 155 and 156).

This is a numerous and widespread subfamily possibly reaching its greatest development in South America. The nearctic genera are dealt with by Ross (pp. 64–65). The subfamily appears to be related to the Dolerinae and possibly to the Phyllotomini; various peculiar genera or groups of genera could be separated out as tribes.

It should be noted that in accordance with the above new definition, the following genera with a cross-vein to the anal cell of the fore-wing belong here, and not to the Emphytinae; *Canoniades* Forsius, *Canonias* Konow, *Eriocampidea* Ashmead, *Hemitaxonus* Ashmead, *Pseudohemitaxonus* Conde, *Pseudotaxonus* A. Costa, *Rohweria* Malaise and *Rhogographus* Konow.

(1) Selandriini: in which the upper part of the mesepisternum is divided off from the lower part by a distinct suture or furrow (cf. Ross, fig. 242); to this group belong a few yellow-bodied species, belonging to the holarctic genera *Coryna* Lep. and *Selandria* Leach s.s. *Coryna* is peculiar in having reduced mouth-parts with palps of only 3 and 4 segments.

(2) **Dochmiogleneini** trib. n.: in which the front margin of the mesepisternum is excised at almost a right angle (fig. 1); for the central and south American genus *Dochmioglene* Enderlein (? = *Petersiana* Joergensen).

(3) ? Adelestini: see above and Ross, pp. 67–68.

(4) Stronglyogasterini: for the remainder until they can be further divided.

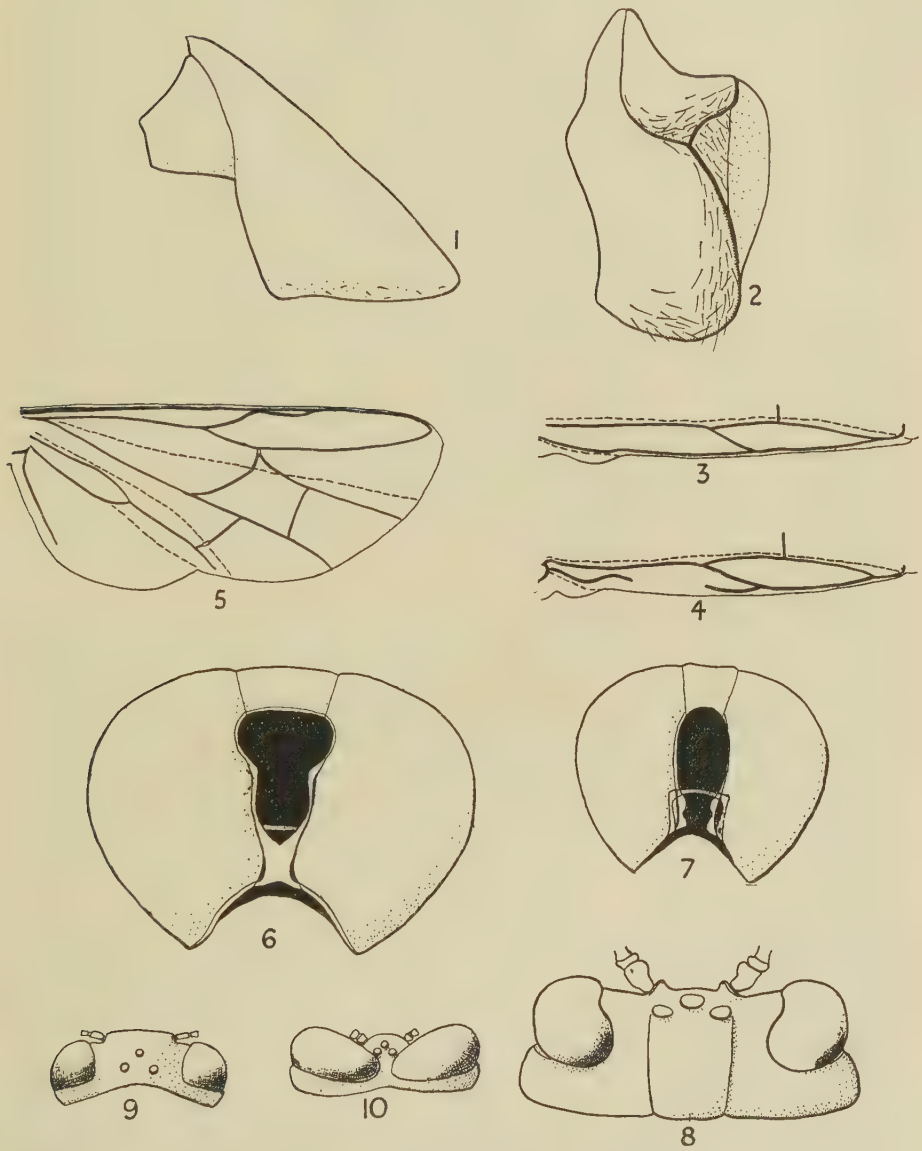
Dolerinae (cf. Ross, pp. 68–69).

Closely related to the Selandriinae with which they agree in the curving back of the base of the cubitus in the fore-wing towards the stigma (Ross, fig. 182); they are easily separated by the regular combination of four characters: prepectus absent, cervical sclerites meeting broadly in front (Ross, fig. 154), second cubital cross-vein absent and cross-vein to anal cell present in fore-wing. The subfamily contains one genus *Dolerus* Panzer, which is holarctic in distribution. The larva which has an asymmetrical labrum is attached to Gramineae, Cyperaceae, Juncaceae and Equisetales.

Tenthredininae (cf. Ross, pp. 102–105).

This subfamily is characterised by the basal vein joining the subcosta far from the origin of the cubitus, by the basal vein being subparallel or even diverging from the 1st recurrent towards the stigma, by the anal cell being contracted or even broken in two in the neighbourhood of the cross-vein where it is generally narrower than at the basal shoulder (Ross, figs. 194 and 196), by the broad meeting of the cervical sclerites in front (Ross, fig. 154) and absence of prepectus. The mandibles of many of the species are enlarged for their carnivorous habit, and the hind legs, especially in the males, are enlarged for seizing their mate when pairing. Certain males have a marginal vein to the hind-wing.

This is a large subfamily reaching its optimum in the Oriental region, being nearly absent from South America, Africa and Australia. Except for a few isolated often monotypic genera, the great abundance of closely related species are difficult to divide into satisfactory genera at all.



FIGS. 1–10.—1. Left mesepisternum of *Dochmioglene* sp.; 2. left mesopleuron of *Athalia* sp.; 3. anal cell of right hind-wing of *Xenapates* sp.; 4. the same of *Ateloza* sp.; 5. right hind-wing of *Senoclia* sp.; 6–7. heads of *Pachylosticta* sp. (6) and *Zaraea* sp. (7) viewed from behind; 8–10. heads of *Trichiosoma* sp. ♀ (8) *Corynis* sp. ♀ (9) and *Zaraea* sp. ♂ (10) viewed from above.

EMPHYTINAE (cf. Ross, pp. 88–94).

This is admittedly rather an arbitrary group and contains various elements which may later have to be considered as separate subfamilies.

It contains all those genera with the generalised anal cell crossed by an oblique vein, with the basal and cubital veins not far separated on the subcosta, with the basal vein subparallel or slightly converging with the 1st recurrent towards the stigma (Ross, fig. 186) and without a prepectus to the mesepisternum. The genera related to *Emphytus* Klug are superficially like TENTHREDININAE with large mandibles, hind legs and cervical sclerites meeting in front, but intermediate stages occur between this and those genera with weak mandibles, small hind legs and cervical sclerites not meeting in front.

Concerning the name of the subfamily, I give the following note: Rohwer and Ross called it ALLANTINAE; EMPHYTINAE (MacGillivray, 1906) has been longer in use and should not be displaced because *Allantus* Panzer 1801 is an older genus than *Emphytus* Klug 1818, these two being *not* congeneric.

Ross (pp. 89–90) suggested three tribes for the nearctic fauna:

(1) Allantini = Emphytini, to include the main mass from *Empria* Lepeletier through *Monostegia* O. Costa, *Monsoma* MacGill., *Ametastegia* A. Costa, leading up to *Emphytus* Klug and *Taxonus* Hartig, etc.
(2) Phrontosomini for the single genus *Phrontosoma* MacGill.
(3) Eriocampini for *Pseudosiobla* Ashmead, *Eriocampa* Hartig and *Dimorphopteryx* Ashmead.

In addition to these might be added:

(4) Athaliini: the single genus *Athalia* Leach (= *Dentathalia* Benson **syn. n.**) represented by a number of Palaearctic, Ethiopian and Oriental species possibly merits subfamily rank. The antennae are more than 9-segmented; the mesopleural or 2nd pleural suture is strongly sinuate so that the hind margin of the mesepisternum is emarginate above and the upper part of the mesepimeron is rounded and convex (fig. 2); the 3rd pleural suture is **Z**-shaped.

(5) **Xenapateini** trib. n.: a group of Ethiopian and Oriental species related to *Xenapates* Kirby and *Allantidea* Rohwer, has a peculiar conformation of the anal cell: the basal part of this cell is almost without any constriction at the basal shoulder, the anal vein being straightened out along the jugal fold (fig. 3) much as in the CEPHIDAE and MEGALODONTIDAE.

(6) **Acideophorini** trib. n. This is erected for a remarkable South American genus *Acideophora* Konow, which has elongated wings and especially stigma. The stigma, unlike that in any other of the EMPHYTINAE, is more than half as long as the radial cell in the fore-wing and the transverse radial nerve is straight and received at a right angle with the radial vein.

(7) **Cladiuchini** trib. n. This is erected for the remarkable Chinese species *Cladiucha insolita* Konow (for the loan of the type of which I am much indebted to Drs. Horn and Sachtleben). Except for its extraordinary antennae, the genus would certainly be placed in the Emphytini; the cervical sclerites, mouth parts, legs, etc., are normal; the antenna is 23-segmented, each segment from 4 to *C.* 15 with an apical projection below; the projections on the middle segments being up to about $\frac{3}{4}$ the length of rest of the segment; the anal cell of the fore-wing has a simple oblique cross-vein, though the basal lobe just in front of the cross-vein is rather faint and almost broken, the hind coxae are enlarged and the tarsal claws have an erect inner tooth longer than the end tooth.

BLENNOCAMPINAE (cf. Ross : 95–101).

This is also admittedly rather an arbitrary group to include those genera with a petiolate anal cell, and with the basal and 1st recurrent veins of the fore-wing subparallel. It contains various elements which are probably not really closely related. This is suggested, for example, by the two ways in which the anal cell of the fore-wing has become petiolate as shown : (1) in *Lycaota* Konow, where the primitive anal cell is simply contracted in the neighbourhood of the cross-vein as in many TENTHREDININAE, and *Tomostethus* Konow, where the basal loop of the same has become faded or almost obsolete (cf. Ross, figs. 192 and 188); (2) in *Ateloza* Enderlein and certain *Blennocampa* spp. (*sens. lat.*), etc., where the primitive anal cell is almost complete as in *Emphytus*, but with a small break in the basal loop near the cross-vein (fig. 4).

Several intermediates between both these extremes and the petiolate anal cell occur, so that no way has been found to separate these elements. The fact that *Tomostethus* and *Ateloza* are able to be placed in separate tribes, by making use of other characters, does not overcome the weakness of relying on the form of the anal cell for defining the subfamily; it is, for example, only by an arbitrary decision that the Atelozini are relegated to the BLENNOCAMPINAE rather than the EMPHYTINAE—possibly they should really form a distinct subfamily. *Cladiucha* has the anal cell in an intermediate condition, but is clearly related closely to the EMPHYTINAE and is able to be separated on antennal characters in the key.

The following small groups can be separated off from the Blennocampini as distinct tribes :

(1) **Tomostethini** trib. n. : for the holarctic genus *Tomostethus* Konow s.s., characterised by the strongly converging basal and first recurrent veins of the fore-wing, by the well-developed basal loop of the anal cell and by the presence of a prepectus.

(2) Phymatocerini : characterised by the presence of a prepectus but with subparallel basal and first recurrent veins of the fore-wing. Holarctic and Oriental : *Amonophadnus* Rohwer, *Atomostethus* Enslin, *Eutomostethus* Enslin, *Megatomostethus* Takeuchi, *Neotomostethus* MacGillivray, *Phymatocera* Dahlbom, *Phymatoceriola* Sato, *Phymatoceropsis* Rohwer, *Tethida* Ross, *Ulotomostethus* Forsius, and *Zaphymatocera* Sato.

(3) Lycaotini see page 361.

(4) **Atelozini** trib. n. : characterised by an almost complete anal cell in the fore-wing (fig. 4) and by the crowding together of the ocelli, the distance between the hind pair being less than the diameter of the front one. *Ateloza* Enderlein (Austro-Oriental).

(5) **Senocliini** trib. n. : for a small group of Austro-Oriental genera in which the point of fusion between the basal and cubital veins of the hind-wing has crossed over the remigial fold and reaches to or very close to the radius (fig. 5) and the basal vein of the fore-wing arises from the cubital vein. *Kampongia* Malaise, *Neoclia* Malaise, *Nesotomostethus* Rohwer and *Senoclia* Cameron.

(6) **Distegini** trib. n. : for the African genus *Distega* Konow (*sens. lat.*); characterised by the division of the mesepisternum into an upper and lower portion by means of a suture or groove as in *Selandria* Leach (Ross, fig. 242); the cervical sclerites also meet in front.

PHYLLOTOMINAE (cf. Ross : 69–72).

As indicated above, this subfamily is made up of four distinct tribes, each of which may later be regarded as a separate subfamily; two of the tribes are leaf-mining but otherwise the tribes have not much in common except that the basal and 1st recurrent veins strongly converge towards the stigma in the fore-wing, and they do not belong clearly to any of the other subfamilies which have this character.

(1) Fenusini: whose larvae, living in leaf-mines, have pseudopods on abdominal segments 2–7 and 10 as in the NEMATINAE, but no other known TENTHREDINIDAE; the anal cell in the fore-wing of the adult is petiolate or divided into two by a wide constriction in the middle; antennae 9 or more segmented. Benson (1936, *Ann. Mag. nat. Hist.* (10) **18 :** 620–626) has recently revised the European genera. Holarctic.

(2) Phyllotomini: also with leaf-mining larvae, but these have pseudopods on abdominal segments 2–8 and 10; the anal cell in the fore-wing of the adult is in the primitive condition with oblique cross-nerve but the basal loop may be faded out in part or broken (Ross, fig. 187), and sometimes the basal shoulder forms a tangent with the anal vein, separating off the basal portion of the cell; basal vein almost straight; antennae more than 9-segmented. One holarctic genus: *Phyllotoma* Fallén.

(3) **Heptamelini** trib. n.: fern-stem-boring species, the adults having only 7- or 8-segmented antennae and an anal cell as in the Phyllotomini; basal nerve of fore-wing curved (Enslin: 244, fig. 67). Two palaearctic and oriental genera: *Heptamelus* Haliday and *Pseudoheptamelus* Conde.

(4) **Caliroini** trib. n.: has leaf-surface feeding slime-covered larvae; adults differing from Phyllotomini by their strongly curved basal vein (Ross, fig. 185), and 9-segmented antennae. Holarctic and oriental, though *Caliroa limacina* Retz. has been introduced as a pest to other parts of the world such as Australia, S. Africa, S. America, etc. Genera: *Busarbidia* Rohwer, *Caliroa* O. Costa, *Endelomyia* Ashmead, *Neopoppia* Rohwer and *Poppia* Konow.

NEMATINAE (cf. Ross : 72–88).

A large and complex subfamily abounding in the north temperate regions, but spreading far north into the arctic, where they become the dominant sawfly and hymenopterous group, and at high altitudes as far south as the equator (*e.g.* Borneo).

The larvae, with those of the Fenusini, differ from all other TENTHREDINIDAE by having pseudopods on abdominal segments 2–7 and (10) only; they are mostly free feeding though some inhabit catkins, galls or mines; *Salix* is the dominant food-plant.

The chief characteristics of the adults are the petiolate or widely contracted anal cell, the strong convergence of the basal and first recurrent veins, together with the frequent disappearance of the transverse radial vein and the enlarged 3rd cubital cell which usually receives both recurrent veins in the fore-wings (Ross, figs. 191, 193 and 195), the hind-wings always with two enclosed cells, the cervical sclerites not meeting in front, the mostly long malar space and the presence of a prepectus.

The group is divided up into several small genera and a few very large ones, further division of which is extremely difficult owing to the great abundance of closely related species.

At least two tribes can be segregated from the main mass of Nematini :

(1) Cladiini : in this tribe the 2nd and 3rd cubital cells of the fore-wing each receive one recurrent vein, the basal vein joins the subcosta close to the origin of the cubitus, and the anal cell is divided into two by a large medial contraction; in some species, especially the males of *Cladius*, some of the basal flagellar segments of the antennae have apical projections (Ross, fig. 104). Ross and others consider this to be a separate subfamily. Holarctic : of the three genera *Cladius* Panzer, *Priophorus* Dahlbom and *Trichiocampus* Fallén; the last two require re-defining and will probably have to be fused into one or considerably further divided (see Benson, 1936, *Ent. mon. Mag.* **72** : 206).

(2) **Pseudodineurini** trib. n. The three leaf-mining genera *Pseudodineura* Konow, *Endophytus* Hering and *Kerita* Ross have tridentate mandibles and no anal cell in the hind-wing and are probably better regarded as forming a distinct tribe. Holarctic.

10. Diprionidae (cf. Ross : 56–58) : holarctic ; the eight nearctic genera are dealt with by Ross; this includes all the Palaearctic genera except *Microdiprion* Enslin.

The larvae are attached to Coniferae and have pseudopods on segments 2–8 and 10, and 3-segmented antennae.

11. Blasticotomidae : confined to the Palaearctic and Oriental regions where at present there are only three species known belonging to two genera, *Blasticotoma* Klug and *Runaria* Malaise. The fore-wing is figured by Enslin (p. 626, fig. 134); the antenna by Ross (fig. 96). The species are keyed by Gussakovsky (1935).

The larvae are stem borers in ferns and have no abdominal legs (Meijere, 1911, *Tijds. Ent.* **54** : 86–95, figs. 1–12).

12. Cimbicidae (cf. Ross 59–60). Malaise (1935, *Ark. Zool.* **27** (A) : 34–36) associated the Syzygoniinae with the Cimbicinae into one family. Such a conclusion is unwarranted on the morphological differences between these groups shown in this paper. Malaise then divided the Cimbicinae on the character of the anal cell in the fore-wing into two tribes : Cimbicini and Zaraeini. Ross does not consider this character as being of sufficient importance and does not recognise the division. Conde, 1937, *Not. ent.* **17** : 14–15, has keyed the genera of this family, excluding the Cimbicinae. The fossil *Phenacoperga* Cockerell and *Pseudocimbex* Rohwer may belong here in a separate subfamily.

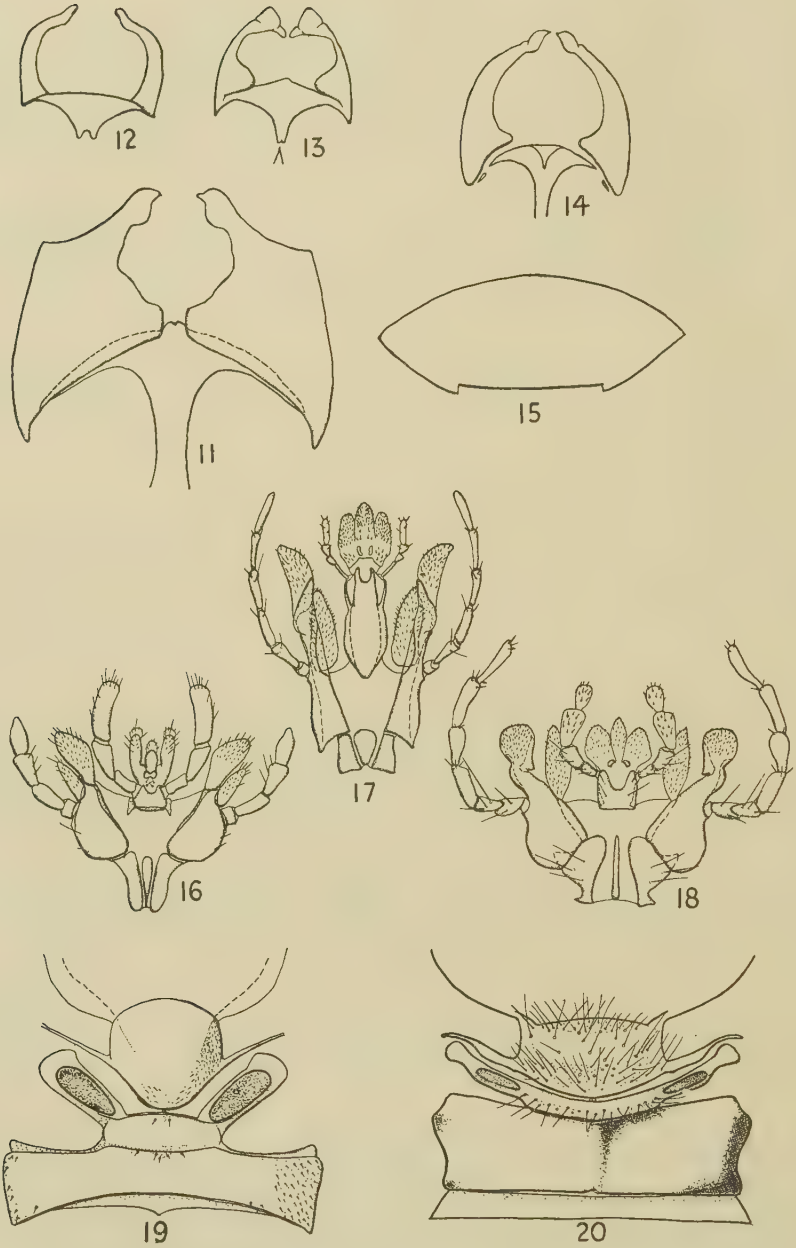
The larvae have pseudopods on segments 2–8 and 10 and single-segmented antennae; they are free living mostly on deciduous trees in the holarctic and neotropical regions.

Key to subfamilies.

1. Anal cell of fore-wing divided in two by a contraction in the middle; cervical sclerites are far apart in the middle and tend to fuse up with the lateral arms of the presternum to form a precoxal bridge (figs. 12–14) . . . . 2.

–. Anal cell of fore-wing crossed by a vein; cervical sclerites nearly meet in the middle line in front and partly obscure the presternum (fig. 11). [Mandibles of ♂ much enlarged; eyes parallel; cenchri mostly small.] Holarctic . . . . . Cimbicinae.

(*a*) Labrum very small so that at most it occupies $\frac{1}{4}$ of the front clypeal margin. Genera : *Agenocimbex* Rohwer, *Cimbex* Olivier, *Odontocimbex* Malaise, *Palaeocimbex* Semenov and *Praia* André. (= *Cimbicides* Malaise) Cimbicini.



FIGS. 11–20.—Cervical sclerites of *Trichiosoma* sp. (11), *Corynis* sp. (12), *Zaraea* sp. (13), and *Pachylosticta* sp. (14); diagrammatic cross-section through abdomen of typical Cimbicid (*Abia* sp.) (15); labium and maxillae of *Pachylosticta* sp. (16), *Corynis* sp. (17) and *Abia* sp. (18); scutellum, cenchri and 1st abdominal segment in *Pachylosticta* sp. (19) and *Abia* sp. (20).

(*b*) Labrum very large so that it occupies at least ½ of the front clypeal margin. Genera: *Leptocimbex* Semenov, *Pseudoclavellaria* Schultz, and *Trichiosoma* Leach . . . . . (=Trichiosomides Malaise) Trichiosomini.

2. Front and lateral lobes of mesonotum separated by clearly defined furrows; scutellum with curved front margin; mouth-parts much shorter than total length of head capsule (figs. 16 and 18); antennae about as far from the front of the clypeus as the breadth of the clypeus; head behind the eyes well developed so that the distance between the hind ocelli is usually much less than the distance from an ocellus to the back of the head; head behind convex and not carinate . . . . . 3.

–. Front and lateral lobes of mesonotum scarcely defined, the furrows being nearly obsolete; scutellum with front margin almost straight; mouth-parts produced into an elongate tongue which is longer than the total length of the head capsule (fig. 17); face very long, the antennae being about twice as far from the front of the clypeus as the breadth of the clypeus; head behind the eyes very short, and the distance between the hind ocelli is greater than the distance of one of them to the back of the head (fig. 9); hind margin of head carinate and fitting close on to the thorax. [Head with maxillaria bridge; praecoxal bridge well developed (fig. 12);] Palaearctic, chiefly Mediterranean. Genus: *Corynis* Thunb. (= *Amasis* Leach) . . . . . **Coryninae** subf. n.

3. Eyes converge behind and much enlarged in ♂ (fig. 10); malar space longer than the two basal segments of the antenna together.

[Scutellum about twice as broad as long; cenchri small so that the distance between them is more than three times the breadth of one (fig. 20); labial palp 4-, maxillary 6-segmented (fig. 18); head open (fig. 7); cervical sclerites (fig. 13).] Holarctic. Genera: *Abia* Leach, *Allabia* Semenov and Gussakovsky, *Orientabia* Malaise and *Zaraea* Leach . . . Zaraeinae.

–. Eyes converge in front or are subparallel and are not noticeably enlarged in ♂; malar space linear or at any rate much shorter than the scape of the antenna.

[*Pachylosticta* Klug and *Pseudopachylosticta* Mallach have head with a maxillaria bridge (fig. 6), labial palps 3- and maxillary palps 4-segmented (fig. 16), cenchri so large that the distance between them is less than twice the breadth of one, scutellum as long as broad (fig. 19), and stigma of ♂ produced forward; cervical sclerites (fig. 14).

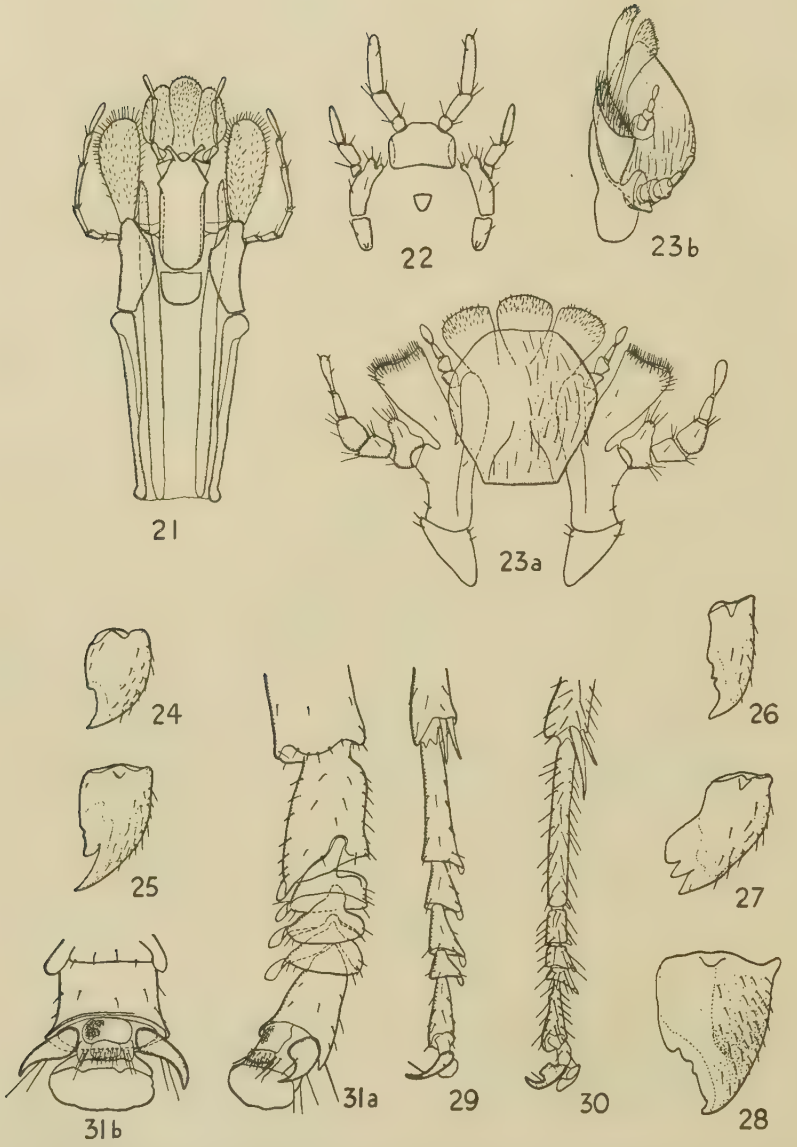
Pseudabia Schrottky, *Enslinia* Jörgensen, *Brasilabia* Conde and *Lopesia* Conde have 4- and 6-segmented palps, scutellum broader than long and normal stigma in ♂.] S. American . . . . . **Pachylostictinae** subf. n.

13. Argidae (cf. Ross: 51–55). No recent classification of the Argidae has been suggested. C. G. Thomson (1871, *Hymenoptera Scandinaviae* 1) made two tribes Hylotomides and Schizocerides, separated by whether or not the intercostal area of the fore-wing is crossed by a vein. Rohwer (1918, *Ann. Mag. nat. Hist.* (9) **9**: 434–435) called these the Arginae and Schizocerinae and added to them the Zenarginae for the peculiar Australian genus *Zenarge* Rohwer.

The large size of the family which is represented in all the zoogeographical regions, except possibly Madagascar, make a ready classification difficult, and, no doubt, the scheme put forward here will have to be considerably enlarged as time goes on, especially to deal adequately with those genera now included arbitrarily under the Sterictophorinae.

The last attempt to key the genera of the world was by Konow (1907, *Z. Hym. Dipt.* **7**: 184–188), but many genera have been added since then.

Ross has dealt with the Nearctic and Gussakovsky (1935) with the Palaearctic genera.



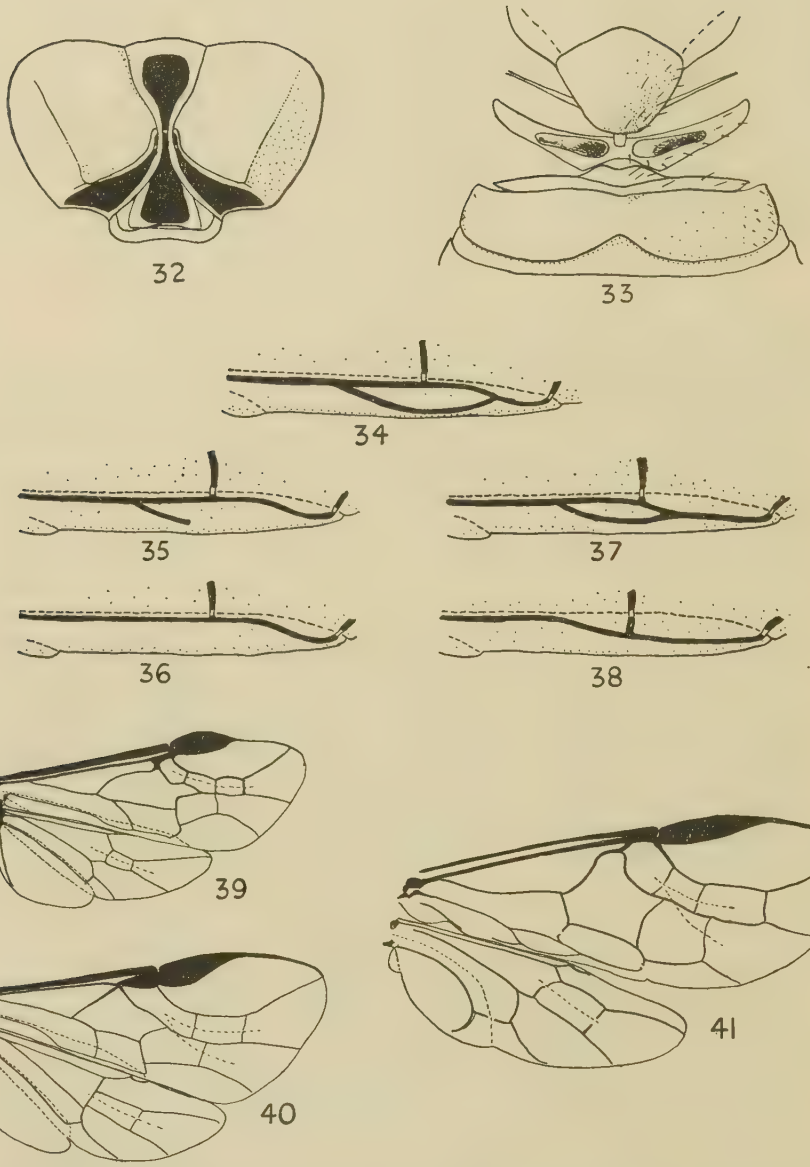
Figs. 21–31b.—Labium and maxillae of *Trichorhachus australis* Westwood (21), *Themos* sp. (22), and *Pachylota audouinii* Westwood (23a from above and 23b from the side); left mandible of *Arge* sp. (24), *Zenarge* sp. (25), *Trichorhachus australis* Westwood (26), *Atomacera* sp. (27) and *Themos* sp. (28), viewed from in front; tarsal segments to front leg of *Arge* sp. (29), *Atomacera* sp. (30) and *Pachylota audouinii* (Westwood) (31a laterally and 31b from in front).

The social habit of *Dielocerus* Curtis, *Digelasinus* Malaise and *Pachylota* Westwood remind one of *Perga* Leach (PERGIDAE); in all four genera the female sits over and protects her young, which, in the ARGIDAE, finally build their cocoons massed together within a communal covering. *Pachylota* differs from all other sawflies in having no spurs at the apices of any of the tibiae. *Zenarge* Rohwer is unique in the Strophandria in having two preapical spines on the middle tibia and probably represents a generalised Argid type, but at the same time it alone of the ARGIDAE has small cenchri—thought to be a specialised reduction (Mallach, 1937).

The larvae are free living and have pseudopods on segments 2–5, 2–6 or 2–7 as well as 10; the antenna is one-segmented.

Key to subfamilies.

1. Hind and middle tibiae with preapical spines . . . . . 2.
–. Hind and middle tibiae without preapical spines . . . . . 4.
2. Middle tibia with one preapical spine; anal cell in fore-wing widely contracted or petiolate; anal cell present in hind-wing and two enclosed middle cells, a discoidal as well as cubital; cenchri very broad and much closer together than the breadth of one (fig. 33) . . . . . 3.
–. Middle tibia with two preapical spines; anal cell of fore-wing with oblique cross-vein; hind-wing with anal cell absent and only one enclosed middle cell, the cubital; cenchri small so that the distance between them is almost the same as the breadth of one. [Male flagellum simple, female subclavate; mandible (fig. 25). Australian. Genus: *Zenarge* Rohwer. . ZENARGINAE.
3. Intercostal vein present in fore-wing; male antenna with flagellum not bifid; female antenna subclavate; labium shorter than head; mandibles usually without inner teeth beyond the basal lobe (fig. 24). Holarctic, S. American, Ethiopian, Oriental and Australian. Genera: *Antargidium* Morice, *Arge* Schrank, *Scobina* Lep., *Stelidarge* Konow, *Triarge* Forsius . ARGINAE.
–. Intercostal vein absent in fore-wing; male antennae with the flagellum bifid, ♀ spindle-shaped; labium in some species extended so that it is longer than the head (fig. 21); right mandible with small subapical teeth (fig. 26). [I have completed a revision of this subfamily which, I hope, will shortly be published.] W. Australian. Genus: *Trichorhachus* Kirby **TRICHORHACHINAE** subf. n.
4. Intercostal vein present in fore-wing . . . . . 5.
–. Intercostal vein absent . . . . . 9.
5. Radial cell of fore-wing closed at apex; mandibles usually with no apical teeth on the inner margin; claws simple, without a large basal lobe; anal cell present in hind-wing; front tibial spurs almost of equal length . . . 6.
–. Radial cell of fore- and hind-wings open apically; mandibles with two or three apical teeth on the inner margin (fig. 27); claws with a large basal lobe; outer front tibial spur about twice as long as the inner one (fig. 30). (Anal cell absent in hind-wing; ♂ flagellum simple, ♀ setiform or spindle-shaped.) N., C., & S. American. Genus: *Atomacera* Say. **ATOMACERINAE** subf. n.
6. Female flagellum about as broad near the base as near the apex (either because it is swollen basally or because it tapers apically); ♂ flagellum bifid . . . . . 7.
–. Female flagellum subclavate, being at least twice as broad apically as basally; ♂ flagellum not bifid.
[(*a*) Post-clypeal suture absent; cervical sclerites meeting broadly in front and anal cell present in hind-wing.] Mostly Oriental and E. Palaearctic. Genera: *Asiarge* Gussakovsky, *Athermantus* Kirby, *Cibdela* Konow, *Kokujewia* Konow, *Pampsilota* Konow, *Sinarge* Forsius **Athermantini** trib. n.



Figs. 32–41.—32. Head of *Themos* sp. from behind; 33. scutellum, cenchri and 1st abdominal segment of *Arge* sp.; 34–38. anal region of right fore-wing in Pergidae to show two ways of losing the anal cell. Fig. 34 represents the generalised condition as found in *Perreyia* etc. In fig. 35 (*Ancyloneura* etc.) and fig. 36 (*Perga* etc.) the anal cell is lost by fading out of the loop from the apex; in figs. 37 and 38 (*Philomastix* etc.) the cell is lost through the closing up of the cell and migration of the submedian vein away from the vanal fold; right wings of *Phylacteophaga* sp. (39), *Acordulecera* sp. (40) and *Cladomacra macropus* Smith (41).

(*b*) Post clypeal suture present; cervical sclerites forming precoxal bridge; anal cell in hind-wing absent. Ethiopian. Genera: *Calarge* Enslin and *Sjoestedtia* Konow . . . . . **Sjoestedtiini** trib. n.

(*c*) Post-clypeal suture present; cervical sclerites meeting in front; anal cell in hind-wing present. Oriental. Genus: *Tanyphatnidea* Rohwer. **Tanyphatnideini** trib. n., **ATHERMANTINAE** subfam. n.

7. Median veins not bifid basally; radial cell of hind-wing open or closed apically; cenchri almost as far apart as the breadth of one; distance between eyes in front much greater than the greatest length of one; maxillary palps shorter than length of an eye; cervical sclerites meet broadly in front . . . . . 8.

–. Median veins of both fore- and hind-wings bifid at base, so as to enclose an intermedian cell at the base of the submedian; radial cell of hind-wing open apically; cenchri closer together than half the breadth of one; eyes converge in front so that they are closer than the length of an eye; maxillary palp longer than the height of the head, the apical segment being particularly long; cervical sclerites not meeting in front; S. American. Genus: *Eriglenum* Konow. . . . . **ERIGLENINAE** subfam. n.

8. Front tibia with at least one apical spur, middle and hind tibiae always with two; tarsi normal with at least claw-bearing segment longer than broad; scape of ♀ antenna with flagellum at most scarcely broader than the distance between the insertions of the antennae; head narrower than thorax and less than ½ as long as broad.

[Larvae feed together socially and build a communal nest (cf. Bischoff, 1927, p. 181, figs. 78–80).] S. American. Genera: *Dielocerus* Curtis and *Digelasinus* Malaise . . . . . **DIELOCORINAE** subfam. n.

–. Tibiae incrassate and without apical spurs; tarsal segments grotesquely swollen so that segments 2, 3 and 4 as well as the claw-bearing segment are actually broader than long (cf. figs. 29, 30 and 31, *a* and *b*); ♀ antennae swollen so that the scape, for instance, is much broader than the distance between the antennal insertions; head grotesquely swollen behind the eyes, being broader than the thorax and also as much as half as long as broad.

[Larvae social, building a communal nest, the female sitting over and protecting them.] S. American. Genus: *Pachylota* Curtis. **PACHYLOTINAE** subfam. n.

9. Mandibles very broad, about two-thirds as broad at base as the length (fig. 28); cervical sclerites meeting broadly in front; ♂ antenna? simple; costa of fore-wing scarcely swollen apically; mouth-parts much reduced (fig. 22), the labium having no lobes and both maxillary and labial palps being only 3-segmented. [Head from behind (fig. 32).] S. American. Genera: *Themos* Norton and *Adierna* Enderlein. . . **THEMINAE** subfam. n.

–. Mandibles quite twice as long as broad; cervical sclerites not meeting in front; ♂ antennae with flagellum bifid; costa of fore-wing strongly swollen so that at least basally it is broader than intercostal area; mouth-parts normal . . . . . STERICTOPHORINAE.*

* The genera that fall here can provisionally be further divided thus:

A. Radial cell of hind-wing closed and with apical cell.

a. Hind coxae contiguous. S. American and Nearctic genera: *Adugzoa* Malaise, *Ptilia* Lep., *Tanyphatna* Konow, *Trochoptera* Konow and *Triptenus* Malaise. [*Trochoptera* Konow has, in the ♂, an enlarged disc-like sclerotised anal-lobe to the hind-wing, see Hobby, 1937, *Proc. R. ent. Soc. Lond.* (A) **12**: 72, fig. 1.] **Ptiliini** trib. n.

b. Hind coxae farther apart at the base than the breadth of the apex of a coxa. S. American. Genus: *Topotrita* Kirby . . . . . **Topotritini** trib. n.

B. Radial cell in hind-wing open apically and without additional apical cell.

a. Hind coxae contiguous or nearly so. Holarctic, S. American and Australian. Genera: *Aproceros* Malaise, *Aprosthema* Konow, *Ardua* Malaise, *Hemigymnia*

14. Pergidae. The Pergidae in this paper include the Pergidae, Loboceridae, Perreyiidae and Pterygophoridae of Rohwer (1911) as well as the Acorduleceridae of Ross (pp. 55–56).

In 1934 I fused the Perreyiidae with the Pterygophoridae, and suggested four subfamilies for the group and in 1935 I suggested seven subfamilies for the Pergidae; each of these subfamilies, with the addition of a few more, making a total of 14, are now regarded as subfamilies of the Pergidae because it has been found impossible to maintain the division of this complex into five families.

As I have said above, a detailed comparative study of almost any organ will reveal obvious examples of parallel evolution or convergence. So much is this so that one is left with a final doubt as to where similarities of organs in different groups can be taken to indicate relationship when no other evidence is available. It is possible to form various entirely different major divisions of the complex according to which set of organs is regarded as most likely to reveal relationships.

If it be assumed that the current theories about the ancestral hymenopterous wing being many veined are correct, and the hypothetical generalised hymenopterous wing as being Xyelid-like accepted, then it is noteworthy that the Pergidae are very far removed from this type. In fact, in reduction of the venation, especially in the anal area of the fore-wing, they have proceeded further than any other sawflies. They appear on this basis to be a highly specialised and advanced group. The Xyelidae are, so far as is known, entirely holarctic and oriental in distribution.

There is, however, no *a priori* reason why any special phylogenetic significance should be given to wing venation. It is easy to see, it has been much used in the past, and it is almost all that one has from the fossils; these considerations should not mislead entomologists any longer into thinking that *therefore* it is necessarily more significant than any other evidence; for, though *Xyela* may be generalised in some of its characters, it is highly specialised in others, such as the mouth-parts, the antennae, the form of its mesosternum, the reduced cenchri, and the elongate ovipositor.

In the account that follows, other highly specialised characters in the Pergidae will be dealt with. Now, in contrast to these, certain parts of the insects, such as the cenchri, are retained in a presumably more primitive condition in the Pergidae than anywhere else in the sawflies. According to Mallach (1936), these organs are derived from the first intersegmental membranes. In the Perginae and the other Pergidae in which the preapical tibial spines are retained, the cenchri still often reach more than half the breadth of the first tergum (fig. 45). The frequent retention of preapical tibial spines and sternopleural sutures are also regarded as primitive characters.

The main characters made use of in the present suggested scheme of classification for the Pergidae will now be discussed separately; in the table on page 378 an attempt has been made to show these at a glance. The symbol "X" indicates that the particular character mentioned is universal in all examples examined of the particular family indicated; "(X)" indicates that

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Malaise, *Manaos* Rohwer, *Neardua* Malaise, *Nematoneura* André, *Neoptilia* Ashmead, *Pseudocyphoria* Ashmead, *Pseudaprosthema* Gussakovsky, *Schizocerella* Forsius, *Sofus* Malaise, *Sterictophora* Billberg, *Tanymeles* Konow, *Trailia* Cameron . . . . . **Sterictophorini** trib. n.

b. Hind coxae farther apart at the base than the breadth of the apex of a coxa. S. America.

Genera: *Sericocera* Brullé, *Brachyphatnus* Konow . . . **Sericocerini** trib. n.

the character is either transitional, or else, though present, is not universal and may be transitional or absent in some representatives.

Of the four types of *head capsule* in Ross' classification the " closed " type (Ross, fig. 5) occurs only in the MEGALODONTIDAE and PAMPHILIIDAE; the " genapontal " type (Ross, fig. 19) occurs only in all the Siricoidea; but both the " maxapontal " (Ross, fig. 8) and " open " types (Ross, fig. 2) occur in the PERGIDAE. Ross noticed the " maxapontal " head only in the CEPHIDAE, but in addition to the SYZYGONIINAE, PARALYPIINAE and LOBOCERINAE of the PERGIDAE it occurs also in some of the CIMBICIDAE (*Corynis* Thunb. and *Pachylosticta* Klug) and is closely approached in certain ARGIDAE such as *Pachylota* Curtis. The " open " type of head is characteristic of all sawflies other than those just mentioned.

The *mouth-parts* show a great range of form; the reduction and disappearance of the lobes of the labium seem to have taken place independently in a number of different groups of PERGIDAE as well as in the SIRICIDAE (Ross, fig. 84) *Themos* Norton of the ARGIDAE (fig. 22) etc.

Various forms of sawfly mouth-parts are shown in plates III, IV and V of Ross' work.

The different tendencies in the *antennae* are less simple to differentiate; in the extremes they may become very short, the number of segments being much reduced either so as to form a club: CIMBICIDAE, (Ross, figs. 99 and 100), PERGINAE, SYZYGONIINAE; or else a short thread: ACORDULECERINAE (Ross, fig. 95); or they remain (or become) many segmented, often developing elaborate prolongations to the individual segments, usually more especially in the males.

The *cervical sclerites* or axis tend to specialisation in two directions: either they tend to meet squarely in front, often overlapping the presternum (cf. fig. 11, and Ross, figs. 130–133 and 158)—this is characteristic of all the Orthandria and most other Hymenoptera; or, as in certain families of Protandria, the ventral arms of the cervical sclerites become more and more widely separated, leading to the condition when they are united with the lateral angles of the presternum to form a precoxal bridge (cf. figs. 14, 13, 12, and Ross, figs. 156 and 159).

The tendency to obsolescence of the furrows separating the lobes of the *mesonotum* is not limited to the ACORDULECERINAE, as suggested by Ross, but occurs also in varying degrees in the ARGIDAE, CIMBICIDAE (especially *Corynis* Thunb.) and EURYINAE of the PERGIDAE. Departures from the normal form of *scutellum* occur in the PERGINAE and PHILOMASTICINAE, where it is distinctly bilobed (figs. 45 and 47) and the ACORDULECERINAE, PHYLACTEOPHAGINAE and LOBOCERINAE where it is carinate behind (figs. 44, a and b).

The enlarged *cenchri* (figs. 42–47) are a special feature of certain PERGIDAE; in some groups these are partially covered by the scutellum (fig. 47). In nearly all other sawflies the cenchri are much more specialised by reduction (cf. fig. 20).

In some groups the *propodeum* or first abdominal tergum is so very strongly emarginate behind that a large unsclerotised area is exposed (figs. 44, *a* and *b*); this extreme condition is again peculiar to certain PERGIDAE, although in much lesser degree, occurring in the Orthandria and other families.

In all the Orthandria and most of the TENTHREDINIDAE the apical *tibial spurs* of the front legs are highly specialised (Ross, figs. 114 to 119); in all the other sawflies, that is, all the PERGIDAE together with the ARGIDAE, CIMBICIDAE, BLASTICOTOMIDAE and DIPRIONIDAE, they are simple except that in the

Pergulinae, Phylacteophaginae and a few Argidae (*Digelasinus* Malaise) the inner spur is vestigial and in *Pachylota* Curtis (Argidae) which has no apical spurs to any of the tibiae (fig. 31a). *Preapical spines* occur on the middle and hind legs of several of the Pergidae, while in the peculiar Lobocerinae long spines are present on the middle legs but there are none on the hind legs!

The *wing venation* throughout the Pergidae is rather uniform, but there is never a cross-vein to the radial cell of the fore-wing nor a closed discoidal cell in the hind-wing; a strong thickening of the costa is characteristic of

	Head with maxillaris bridge.	Labium trilobed.	Antennae long and serrate or pectinate.	Cervical sclerites meeting in front.	Cervical sclerites form a pectoral bridge.	Precostal furrows obsolescent behind.	Scutellum carinate behind.	Scutellum bilobed behind.	Cenchri nearly meeting in the middle.	Propodeum strongly emarginate behind.	Costa of forewing swollen.	Middle and hind tibiae with preapical spines.	Fore tibia with internal spur vestigial.	Australia.	S America.	N America.	Celebes.
Philomastiginae.			+		+			+	+			+		+	+		
Perginae.		[+]		+				+	+		+	+		+			
Pteryperginae.	+	+		[+]					+			+		+			
Styracotechyinae.		+							+	+		+		+			
Phylacteophaginae.		+		+		+	[+]		+		[+]	+	+	+			
Syzygoniinae.	+				+				+		+	+			+		
Paralypiinae.	+				+				+	+	+	+			+		
Acordulecerinae.		+			+	+	+		+	+	+	+			+	+	
Lobocerinae.	+	+			+		+		[+]			Middle tibia only.			+		
Pergulinae.		+		[+]					[+]		+		+	+	+		
Concocerinae.		+								[+]					+		
Euryinae.		+	[+]	[+]		[+]			+		[+]			+			
Perreyiinae.			+		+										+		+
Pterygophorinae.		+	+		+									+			

TABLE 2.

MAIN CHARACTERISTICS OF THE SUBFAMILIES OF THE PERGIDAE COMPARED.

only certain subfamilies. As indicated above, the reduction and final disappearance of the petiolate anal cell in the fore-wing seems to have gone much farther in the Pergidae than in any other sawflies. In doing so it seems generally to have followed one or other of two lines:

(i) by the gradual fading out of the lower loop of anal cell from the apex, cf. *Ancyloneura* Cam., *Perga* Leach etc. (figs. 34–36);

(ii) by the closing up of the anal cell from the apex, by the migration of the apex of the submedian away from the vanal fold until it fuses with the anal vein cf. *Haplostegus* Konow, *Philomastix* Frogg. etc. (figs. 37 and 38).

On the *larvae* very little can be said, since far too little is known for any generalisations to be made. The little that is known reveals some remarkable

cases of specialisation. The PERGINAE for example, though free-living, have no abdominal pseudopods, while the SYZYGONIINAE have them well developed. *Haplostegus* Konow (PERGULINAE) has pseudopods on the first abdominal segment such as occur in the XYELIDAE of Orthandria, but in no other family. *Syzygonia* Klug and *Philomastix* Frogg. both have a pair of long tails on the last segment, while some species of *Pterygophorus* Klug have a long single projection from the last segment.

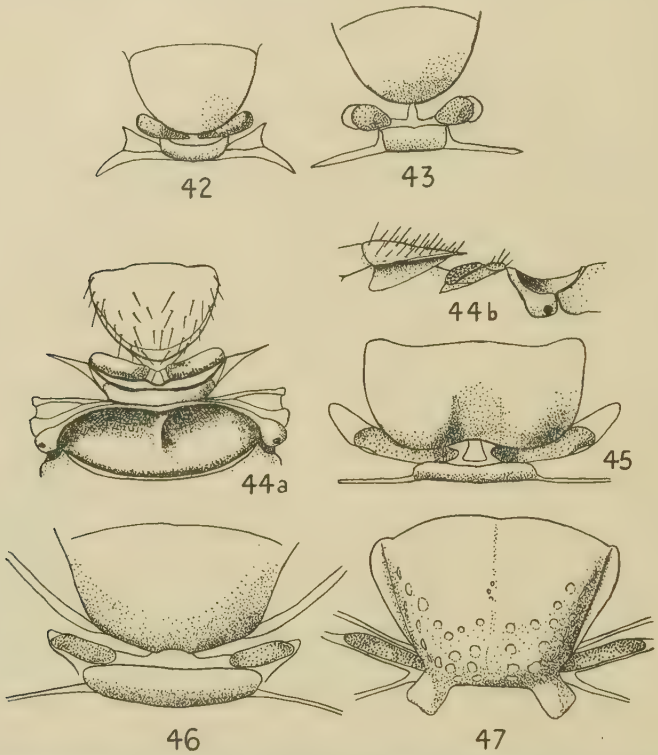
Key to subfamilies.

1. Hind tibia with a preapical spine . . . . . 2.
–. Hind tibia without a preapical spine . . . . . 9.
2. Scutellum either bilobed or with a backward projection from each of the hind angles (figs. 45 and 47) . . . . . 3.
–. Scutellum without lobes or paired projections behind (figs. 44 etc.) . . 4.
3. Scutellum slightly bilobed, the hind margin being indented in the middle line (fig. 45); costa not swollen and much narrower than the intercostal area, antenna with 13 or more segments and serrate, each segment being much broader apically than basally; anal vein of fore-wing is bent away from anal fold apically (cf. fig. 38); cervical sclerites form a precoxal bridge (cf. fig. 12); mouth-parts with palps 4- and 3-segmented; labium without lobes and labial palp with a large sensory cup on the apical segment. [The larva of *Philomastix glaber* Froggatt is described by Froggatt in 1902, *Agric. Gaz. N.S.W.* **12**: 1070; it has no abdominal legs but two long anal tails.]
   Australia and ?Chile. Genera: *Philomastix* Froggatt (Australia) and ?*Cerospastus* Konow . . . . . PHILOMASTIGINAE.
–. Scutellum with a backward projection from each of the hind angles; costa strongly swollen so that it touches the subcosta at least apically and is much broader than the intercostal area; antenna rarely 13-segmented, generally much shorter and clavate or capitate; anal vein in fore-wing is straight and close to the vanal fold throughout (cf. fig. 36); cervical sclerites meet broadly in front, overlapping the prosternum (cf. fig. 11); mouth-parts with maxillary palps 4–6 and labial palps 3–4 segmented; labium with 1 or 3 lobes, apical segment of labial palps without a definite sensory pit.
   [The larvae have no abdominal legs though well-developed thoracic legs, see various papers by Froggatt, and Tillyard 1926 (*The Insects of Australia and New Zealand*: 260, fig. T11). I have already completed a revision of the genera and species of this subfamily and this I hope will shortly be published.]
   Australia. Genera: *Cerealces* W. F. Kirby, *Perga* Leach, etc. . PERGINAE.
4. Fore tibia with two almost equal apical spurs; abdomen normal; head normal; malar space short, little more than length of pedicel at most; antennae set close to hind margin of clypeus; fore-wing with 1st recurrent vein nearly straight throughout and subparallel with basal vein . 5.
–. Fore tibia with only one apical spur; abdomen long and tapering posteriorly—in ♀ tergum 9 elongate; head twice as broad as high when viewed from in front; eyes almost circular when viewed from the side and set far away from the mandibles leaving a malar space about as long as ½ the diameter of an eye; antennae set behind the clypeus at a distance of about the length of the malar space; fore-wing with the 1st recurrent vein bent at a right angle in the middle, so that, whereas the hind or inner portion of the vein runs towards the base of the stigma, the front or outer portion runs towards the apex of the wing and joins the cubital vein near the middle of the 2nd cubital cell (fig. 39).

[Mouth-parts with trilobed labium, palps of 4 and 3 segments and mandibles with a small sub-basal tooth. Larvae are without abdominal legs and live in leaf-mines on *Eucalyptus*.]

E. Australia. Genus: *Phylacteophaga* Froggatt . . PHYLACTEOPHAGINAE.

5. Scutellum without a carinate margin between the upper and the hind surfaces or the veins forming the apex of the median cell in the hind-wing not in a straight line and the cell is shorter above than below (as in fig. 39) 6.



FIGS. 42–47.—Scutellum, cenchri, and base of abdomen in *Eurys* sp. (42), *Perreyia* sp. (43), *Acordulecera* sp. (44a from above, 44b from left side) *Philomastix* sp. (45), *Pterygophorus* sp. (46) and *Xyloperga* sp. (47).

–. Scutellum with a carinate margin between the upper and the hind surfaces (figs. 44, *a* and *b*); veins forming the apex of the median cell in the hind-wing are almost in a straight line and the cell is longer above than below (fig. 40).

[Mouth-parts with trilobed labium, palps of 6 and 4 segments and mandibles with a single basal tooth or lobe; propodeum strongly emarginate behind so that all except the short front part of this tergum is unsclerotised and white; antenna reduced to 6 or 7 segments and usually setiform and hairy; costa swollen and much broader than intercostal area; prescutal furrows of mesonotum more or less obsolete; anal cell absent in fore-wing and submedian vein diverges from vanal fold apically (fig. 38). The larvae have abdominal legs on segments 2–7 and 10; segments 2–4 or 2–5 and 8 with crescentic sucker-like protuberances; antenna single segmented.]

N. & S. America. Genera: *Acordulecera* Say, *Ceratoperia* Enderlein and *Thulea* Say . . . . . ACORDULECORINAE.

6. Propodeum strongly emarginate behind so that only the front margin and the sides are sclerotised (cf. figs. 44, a and b) . . . . . 7.
–. Propodeum strongly sclerotised all over . . . . . 8.
7. Anal cell absent in fore-wing and submedian vein bending away from vanal fold apically (cf. fig. 38); costa of fore-wing strongly swollen so that it is much broader than the intercostal area; mouth-parts with labium single lobed; head with a maxillaria bridge (cf. fig. 6).
   C. & S. America. Genera: ?*Acorduleceridea* Rohwer, ?*Corynophilus* Kirby, *Giladeus* Bréthes, *Lagideus* Konow, *Paralypia* Kirby and *Skelosyzygonia* Malaise . . . . . PARALYPIINAE.
–. Petiolate anal cell present in fore-wing; costa of fore-wing swollen apically but basally is much narrower than the intercostal area; mouth-parts with trilobed labium; head without maxillaria bridge.
   Queensland. Genus: *Styrachotechys* Benson . . . STYRACOTECHYINAE.
8. Labium trilobed; cervical sclerites overlapping presternum and almost meeting in front (cf. fig. 11); head with maxillaria bridge (cf. fig. 6); scutellum rounded in front and scarcely produced behind so that it does not overlap the cenchri; antenna subclavate.
   S.E. Australia. Genus: *Pteryperga* Benson . **PTERYPERGINAE** subfam. n.
–. Labium single-lobed; cervical sclerites joining the lateral angles of the prosternum to form precoxal bridge (cf. fig. 12); head open behind without a maxillaria bridge (cf. fig. 7); scutellum with an almost straight or sinuous front margin, but so produced behind that it overlaps at least the front inner edges of the cenchri; antenna subclavate and glabrous (*Syzygonia*) or setiform and conspicuously hairy (*Incalia*, etc.).
   C. & S. America. Genera: *Incalia* Cameron, *Parasyzygonia* Rohwer, *Syzygonia* Klug and *Syzygonidea* Ashmead . . . . . SYZYGONIINAE.
9. Middle tibia without a preapical spine . . . . . 10.
–. Middle tibia with a long preapical spine and all the tibiae with very long apical spines; scutellum behind with a carinate margin separating the upper from the hind surface (cf. figs. 44, a and b); antenna 7-segmented and hairy, the last segment in the ♀ having a large apical sensory cup. [Labium trilobed and palps normal; head with broad maxillaria bridge; eyes large so that the malar space is linear and the head little developed behind; anal cell in fore-wing absent; submedian vein curving away apically from vanal fold; cf. fig. 38.]
   C. & S. America. Genera: *Loboceros* Kirby and ?*Hyperoceros* Konow LOBOCERINAE.
10. Fore tibia with two apical spurs; costa narrower than intercostal area . . 11.
–. Fore tibia with only one apical spur; costa broader than intercostal area. [Head open; mouth-parts normal with trilobed labium; antenna 7-segmented; anal cell in fore-wing absent; submedian vein diverges apically from vanal fold (cf. fig. 38); cenchri closer together than the breadth of one.
   Larvae with 5 pairs of abdominal pseudopods including one pair on the first segment (Conde, 1936, *Rev. Ent. São Paulo*, **6**: 122–3).]
   C. & S. America and W. Australia. Genera: *Haplostegus* Konow and *Pergula* Morice . . . . . PERGULINAE.
11. Propodeum normal; hind coxa normal and hind femur does not generally reach beyond apex of abdomen . . . . . 12.
–. Propodeum emarginate behind, leaving exposed an unsclerotised area (cf. figs. 44, a and b); hind coxa enlarged and almost as long as hind femur; apex of hind femur reaches beyond apex of abdomen; coxa and femur are often spined.
   [Head open and mouth-parts normal with trilobed labium; antenna 7-segmented; prescutal furrows obsolete behind; pleurosternal furrows

entirely obsolete; costa narrower than intercostal area; anal cell in fore-wing open apically as in figure 35; cenchri closer together than the breadth of one.]

S. America. Genera: *Aulacomerus* Konow, *Conocoxa* Rohwer, *Lysosceles* Konow and *Nithulea* Rohwer . . . . . **Conocoxinae** subfam. n.

12. Cenchri large, so that the distance between them is at most about as great as the breadth of one (figs. 42 and 43); metascutellum small and scarcely broader than the length of the cenchri; anal cell in fore-wing petiolate, though it may be open apically (figs. 34 and 35); mandibles with at least a basal tooth . . . . . 13.

–. Cenchri small, so that the distance between them is nearly twice as great as the breadth of one (fig. 46); metascutellum large, about the same breadth as the scutellum and about twice as long as the cenchri; anal cell absent in fore-wing; submedian vein almost straight but diverging apically from vanal fold (cf. fig. 38); mandibles without any inner teeth.

[Head open; mouth-parts with normal number of palp segments but may be lengthened abnormally; labium trilobed; 2nd transverse cubital vein absent in fore-wing; costa narrower than intercostal area; sternopleural furrows present.

Larvae are rather flattened and have 7 pairs of abdominal pseudopods on segments 2–8, the first segment being reduced in size; some species have the anal segment produced into a long rat-like tail. I have recently published a revision of this subfamily (1938, *Ann. Mag. nat. Hist.* (11) **1**: 610–622).]

Australia. Genera: *Pterygophorus* Klug and *Platypsectra* Benson Pterygophorinae.

13. Cenchri very broad and separated by a distance not more than the length of one (fig. 42); labium trilobed; cervical sclerites approach each other in front of coxae and in some genera actually meet (cf. fig. 11).

[Small species (under 8 mm.) with antennae usually simply subclavate, though sometimes subserrate and in the ♂ of *Polyclonus* pectinate; in *Ancyloneura* the anal cell of the fore-wing is open apically (cf. fig. 35); pleurosternal furrows usually indicated.

According to Tillyard (1926, *The Insects of Australia and New Zealand* : 265) *Diphamorphos* Rohw. has "dark velvety larvae" which "are found feeding on dead leaves under bark etc.; they much resemble Lepidopterous caterpillars, but have six pairs of prolegs."

The genera and species were revised by Benson (1934), other species were added in a second paper (1935).

Australia and New Guinea. Genera: *Ancyloneura* Cameron (New Guinea), *Clarissa* Kirby, *Diphamorphos* Rohwer, *Eurys* Newman, *Neoeurys* Rohwer, *Polyclonus* Kirby and *Warra* Benson (Australia) . . Euryinae.

. Cenchri separated by a distance not less than the breadth of one (fig. 43); labium single lobed; cervical sclerites usually widely separated and often forming precoxal bridge (cf. figs. 12–13).

[Species often exceed 10 mm.; antennae usually serrate in ♀ but often pectinate in ♂; pleurosternal sutures usually present.

In the anomalous *Cladomacra* Sm. (Celebes) the jugal lobe in the hind-wing is much reduced (fig. 41) and the anal cell is present though open apically. All the other genera are South American and have been dealt with recently by Malaise (1937, *Ent. Tidskr.* **58**: 60–65) and also by Conde and Benson in a joint paper shortly to be published.]

C. & S. America and Celebes. Genera: *Camptoperium* Spinola, *Cladomacra* Smith, *Decameria* Lep., *Endecaria* Malaise, *Hemiperreyia* Malaise, *Heteroperreyia* Schrottky, *Lophyroides* Cameron, *Paraperreyia* Schrottky, *Perreyia* Brullé and *Tristegus* Konow . . . . . Perreyiinae.

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E. Summary of Classification.

HYMENOPTERA SYMPHYTA

Series Orthandria.

- Megalodontoidea
  - Xyelidae
  - Pamphiliidae
  - Megalodontidae
- Siricoidea
  - Syntexidae
  - Xiphydriidae
  - Siricidae
    - Siricinae
    - Tremecinae
  - Orussidae

E. Summary of Classification.—*Continued.*

HYMENOPTERA SYMPHYTA

Cephoidea	
Cephidae	Cephinae
	Athetocephinae
Series Strophandria	
Tenthredinoidea	
Tenthredinidae	Selandriinae
	Dolerinae
	Tenthredininae
	Emphytinae
	Blennocampinae
	Phyllotominae
	Nematinae
Diprionidae	
Blasticotomidae	
Cimbicidae	Cimbicinae
	Coryninae subfam. n.
	Zaraeinae
	Pachylostictinae subfam. n.
Argidae	Zenarginae
	Arginae
	Trichorhachinae subfam. n.
	Atomacerinae subfam. n.
	Athermantinae subfam. n.
	Erigleninae subfam. n.
	Dielocerinae subfam. n.
	Pachylotinae subfam. n.
	Theminae subfam. n.
	Sterictophorinae
Pergidae	Philomastiginae
	Perginae
	Phylacteophaginae
	Acordulecerinae
	Paralypiinae
	Styracotechyinae
	Pteryperginae subfam. n.
	Syzygoniinae
	Lobocerinae
	Pergulinae
	Conocoxinae subfam. n.
	Pterygophorinae
	Euryinae
	Perreyiinae